Host and Oceanic Computer System Replacement Phase 2 Human Factors Assessment

Final Report

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Federal Aviation Administration
William J. Hughes Technical Center
NAS Human Factors Branch, ACT-530

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1. Introduction

The Federal Aviation Administration (FAA) air traffic control en route center automation system receives, processes, distributes, and tracks information on aircraft movement throughout the National Airspace System (NAS). Many of the hardware components of the system have reached or are near the end of their commercial support life and are not certified as year 2000 compliant. The Host and Oceanic Computer System Replacement (HOCSR) program will replace the current Host and Oceanic processors and peripherals. The HOCSR program is structured into phases. Each phase affects both domestic and oceanic environments.

Phase 1 of the HOCSR program replaces the main Host processor with the IBM G3 Processor and runs existing NAS software in emulation mode. The NAS Human Factors Branch (ACT-530) of the FAA William J. Hughes Technical Center conducted a human factors and ergonomics assessment of the new processors and the Hardware Management Console (Yuditsky, 1999). The results of that study apply to both the en route and oceanic domains.

Phase 2 removes the emulation software and upgrades the system software to operate in a native mode. This upgrade brings with it several changes to the system. The biggest change for the user is in the area of NAS Monitor input messages. The syntax of some existing messages will be changed, new messages will be added, and several messages will be deleted. There will also be a change in the display format of the configuration summary. The Integrated Product Team for En Route (AUA-200) tasked ACT-530 to do a human factors assessment of how these changes will affect users in the en route environment.

Two Engineering Research Psychologists from ACT-530 serving as Human Factors Specialists (HFSs) conducted the assessment on October 19, 1999 at the Technical Center. This report describes the findings of the assessment.

2. Method

2.1 Participants

The participants were three NAS Operations Managers (NAS NOMs), one System Program Specialist (SPS), three Airway Transportation Systems Specialists (ATSSs), and three Computer Operators. These Subject Matter Experts (SMEs) represented three en route Air Route Traffic Control Centers. None of the SMEs had any prior training on Phase 2 of HOCSR. On average, the SMEs had 13 years experience in their current positions and they rated themselves as having an advanced level of computer knowledge.

2.2 Materials

AUA-200 provided a listing of every changed, added, and deleted NAS Monitor input message. The HFSs developed a questionnaire that provided brief descriptions of each message change (Appendix A). We provided specific examples of new syntax wherever possible. Following each item description, we asked the SMEs to provide a rating of the impact this change will have

on their job. The questionnaire instructed them to read each change description carefully and to consider

a. how significant the change is,
b. how easy or difficult it will be to adapt to the change, and
c. whether the change increases or decreases the amount of work they have to do or the amount of information they have to remember.

Depending on whether the message was being changed, added, or deleted, we also asked them to evaluate whether

a. the message was going to be used in a way that is contrary or opposite to the way it is currently used,
b. the message provides functionality that is different from that currently available, or
c. the functionality provided with this message was already available through another message.

The SMEs rated the impact on a 5-point scale (1-very low to 5-very high). We asked the SMEs to provide comments if they believed that a change would have a high impact on their job or that a change was an improvement.

2.3 Procedure

We conducted an opening briefing to explain the procedures to be used in the assessment and to review the schedule. We assigned a participant code to each SME that they used on all forms and questionnaires to ensure confidentiality. After the opening briefing, the SMEs completed background questionnaires (Appendix B).

A HOCSR development contractor provided the SMEs with a briefing describing the Phase 2 system changes. After the briefing, the SMEs participated in a laboratory demonstration of the new configuration summary. During this demonstration, they were able to try out some of the changed and new messages. The development contractor was available to answer questions about the Phase 2 changes and how they were being implemented. Following the laboratory demonstration, we distributed the questionnaires and reviewed the instructions for completing them.

During the closing briefing, the HFSs and SMEs discussed their observations. The HFSs focused on understanding and further exploring user comments.

3. Results

The HFSs reviewed and consolidated all user comments and analyzed the impact ratings for each questionnaire item. We discuss the findings in the following sections.

3.1 Impact Ratings

We analyzed the impact ratings together with SME comments. The SMEs reported ratings of high impact when they expected the changes to have a large positive impact as well as when there was a concern that the change may have a negative impact. Our analysis also revealed that the use of some messages, and therefore the impact of changes to these messages, varies with operational position. Some messages are used almost exclusively by one position. The SMEs sometimes commented and provided ratings of how they believed a change will affect the other positions. For these reasons, we did not conduct an overall analysis of impact ratings. Instead, we analyzed impact ratings on an item-by-item basis.

3.2 NAS Monitor Messages

On the basis of SMEs' written and verbal comments and our own observations, we found the overall response to Phase 2 message changes to be very positive. For most changed and added messages, the SMEs reported that the changes were an improvement over the current system.

We found many of the changes to be beneficial from a human factors perspective. Some changes provide a shorter syntax thereby reducing the number of keystrokes necessary to execute a command and reducing the potential for errors on message entry. Other changes provide additional flexibility to the format of input messages and multiple means of executing a command. For example, the current system uses numbers to represent actions on tape devices in the TAPE message (e.g., the number 3 is entered to rewind a tape). One of the Phase 2 changes provides the option of using common mnemonics in the message (e.g., enter REW to rewind a tape).

For messages that refer to the new system architecture, however, the impact of the changes is not trivial. The SMEs commented that, though the changes to existing messages make the messages more useful, it will take time and experience to learn how to use them correctly. One example is the SWAP command. The function of the command has not changed, but the syntax of the message was modified. The change simplifies the message but also introduces the use of channel path identifiers (CHPID). The new syntax uses an easier, shorter format; makes the message easier to understand; and reduces the potential for errors in message entry. However, users must understand the architecture to utilize the message correctly.

In the following sections, we address each type of message (changed, added, and deleted) and present the findings in terms of summary comments and mean impact ratings.

3.2.1 Changed Messages

The SMEs reviewed descriptions of changes for 27 NAS Monitor input messages. When more than one SME commented on a changed message, we combined the comments and calculated mean impact ratings for that message. Tables 1 and 2 present SME summary comments, overall mean impact ratings, and mean impact ratings by position. Table 1 lists messages that received only positive comments. Listed for each message are a summary comment, mean impact rating, number of impact ratings collected (N), and mean impact ratings by position.

Table 1. Changed Messages Positive Comments

Message	Summary Comment	Impact Ratings
Specify DASD (DASD)	This message will be useful for testing. The change is an improvement. The new syntax is less confusing and will minimize address errors on input.	Mean 2.7 (9) NAS NOM 2.5 Operator 3.0 ATSS/SPS 2.5
Scan Disk (SDSK)	This is a very nice tool and a helpful feature.	Mean 2.0 (8) NAS NOM 1.5 Operator 3.0 ATSS/SPS 1.8
Mandatory Replacement of an Operational Element (MREP)	The change makes this a simpler command and reduces the possibility of entry errors. This command is excellent with PAMRI. Users no longer need to worry about even/odd pairing.	Mean 2.4 (9) NAS NOM 3.0 Operator 3.0 ATSS/SPS 1.8
Replace an Operational Element (REPL)	The "with" option is not needed. Command entry will be more efficient with decreased possibility of error.	Mean 2.6 (8) NAS NOM 4.0 Operator 3.0 ATSS/SPS 1.8
Request Logical Device Assignment (ASGN)	This useful change simplifies the command. Multiple means of entry are useful, especially when under time constraints. The message provides a quicker way of displaying device assignments.	Mean 2.6 (10) NAS NOM 2.7 Operator 3.3 ATSS/SPS 2.0
Inquire Assignment of Logical Devices (ISGN)	The changed message syntax provides greater flexibility in message entry. Provides NAS NOMs with an easier and quicker way of displaying the assignment of devices/peripherals.	Mean 2.5 (10) NAS NOM 2.7 Operator 3.3 ATSS/SPS 1.8
Inquire Assignment of Physical Device (DSGN)	The change makes the message more "user-friendly" and more likely to be used.	Mean 2.3 (10) NAS NOM 2.7 Operator 2.3 ATSS/SPS 2.0
No-Op Input/Output on Logical Device (NPIO)	This is a good change. The changed message gives NAS NOMs quicker access to device/peripheral assignments. The added flexibility is welcome, especially when time pressure is high.	Mean 2.6 (10) NAS NOM 3.0 Operator 3.3 ATSS/SPS 1.8
Op Input/Output on a Logical Device (OPIO)	This is a good change because it provides added flexibility in command entry and provides NAS NOMs with an easier means displaying the assignment of devices/peripherals.	Mean 2.3 (9) NAS NOM 3.0 Operator 3.0 ATSS/SPS 1.0
Output Configuration Related Data (OUTP)	This is a nice feature. The change makes the message more "user-friendly".	Mean 2.2 (9) NAS NOM 2.3 Operator 2.7 ATSS/SPS 1.7
Control Tape Logical Device (TAPE)	The ability to use common mnemonics is very useful. Users no longer have to remember which number corresponds to which command. SMEs liked the use of a "VM-like" message.	Mean 2.1 (7) NAS NOM 1.0 Operator 3.0 ATSS/SPS 1.7

Table 2 lists messages that received comments of concern. Listed for each message are a summary comment, mean impact rating, the number of impact ratings collected (N), and mean impact ratings by position.

Table 2. Changed Messages Comments of Concern

Message	Summary Comment	Impact Ratings
Set Non-Operational Units Redundant (SETA)	This is a drastic change for NAS NOMs. NAS NOMs and Computer Operators will have to be more familiar with the new system architecture and have a better understanding of the backup channels. The new way of implementing this is more logical and should speed-up operations.	Mean 3.3 (9) NAS NOM 3.7 Operator 2.5 ATSS/SPS 3.5
Set Non-Operational Units Inactive (SETI)	Making a reference chart for NAS NOMs that shows to which units this message applies to would greatly help in inputting messages correctly.	Mean 2.6 (9) NAS NOM 3.3 Operator 2.5 ATSS/SPS 2.0
Set Non-Operational Units Test (SETU)	This is a big change for NAS NOMs. After some practice, they would know which units/devices to SETA or SETU. This message provides a graceful termination of NASSTBY, which is a nice feature, but a chart showing which units this message applies to would be helpful.	Mean 2.6 (9) NAS NOM 3.0 Operator 2.5 ATSS/SPS 2.3
Swap Peripherals (SWAP)	The new command is easy to use and is less confusing, but users must understand what is actually happening. Hands-on training would be preferable to a self-directed study course. The use of symbolic names and toggling is an improvement.	Mean 2.9 (10) NAS NOM 2.3 Operator 3.7 ATSS/SPS 2.8
Channel Utilization Monitoring (CHNU)	This message is easier to use and is a useful function but this is a different way of doing things and there will be a learning curve to get over. This will force NAS NOMs to better understand the new channel settings.	Mean 2.4 (9) NAS NOM 2.3 Operator 2.5 ATSS/SPS 2.5

3.2.2 New Messages

The SMEs reviewed three new system messages. The comments reflect some concern about using these messages correctly. Using the VARY message, for example, requires an understanding of devices and their paths specified as CHPIDs. It appears that the functionality provided by the new messages will be useful, but it will be necessary for the users to have a thorough understanding of the system architecture to utilize them appropriately. The comments reported for these messages are presented in Table 3. Listed for each message are a summary comment, mean impact rating, the number of impact ratings collected (N), and mean impact ratings by position.

3.2.3 Deleted Messages

Three messages will be deleted as part of Phase 2. The SMEs found these messages to be unnecessary either because they are currently not used or the corresponding equipment is being removed (e.g., the message TDEN is no longer needed because its tape devices are being removed).

Table 3. New Messages Comments of Concern

Message	Summary Comment	Impact Ratings
Inquire Path Assignment (PSGN)	This is a useful feature that will be helpful in troubleshooting the system but it requires an understanding of the ESA390 changes.	Mean 2.9 (9) NAS NOM 3.7 Operator 2.7 ATSS/SPS 2.3
Resume Mode Startover (RESM)	This is a useful feature but NOMs have to be educated as to when to use it.	Mean 2.9 (8) NAS NOM 4.0 Operator 2.0 ATSS/SPS 2.3
Vary Device/Path (VARY)	Very good change. This message is easier to use than NPIO or OPIO, but training has to be provided as to which units this message applies.	Mean 3.1 (10) NAS NOM 3.7 Operator 2.3 ATSS/SPS 3.3

3.3 Changes to the Configuration Summary

The SMEs found the changes to the configuration summary display to be minor. The HFSs did not identify any human factors concerns resulting from changes to the display.

3.4 Other Concerns

We identified a few additional concerns during the assessment. One concern addresses user notification of channel status. There is currently no indication that a channel that had previously been disabled is now available. NAS NOMs have to vary the channel online and need an indication that the channel is available for operational use. Without notification, it is possible that an available channel will not be utilized. The notification may be provided as a system message or handled procedurally.

Finally, there was some concern over how Phase 2 may affect the use of existing data reduction tools. We were not able to provide SMEs with any information on this topic. SMEs stressed the operational importance of these tools. If Phase 2 impacts the use of data reduction tools, we recommend that a review of the changes be conducted with the participation of field personnel.

4. Conclusions

Overall, we found Phase 2 changes to NAS Monitor input messages to be beneficial. Most changes provide users with shorter, more useful messages and add flexibility in message format. These improvements are in accordance with human factors guidelines for command language design as specified in the FAA Human Factors Design Guide (Wagner, Birt, Snyder, & Duncanson, 1996, section 8.1.13).

The principal human factors concern resulting from this assessment is with message changes that refer to the new system architecture (e.g., use of CHPIDs). Though these changes are beneficial, they will require users to think about the system architecture in a new way. We highly recommend that proper training be provided to minimize the incidence of errors. Training should include hands-on experience where users are able to exercise the changed input messages.

References

Wagner, D., Birt, J. A., Snyder, M. D., & Duncanson, J. P. (1996). *Human factors design guide: For the acquisition of commercial-off-the-shelf subsystems, non-developmental items, and developmental items* (DOT/FAA/CT-96/1). Atlantic City International Airport, NJ: Federal Aviation Administration Technical Center.

Yuditsky, T (1999). *Human factors assessment of phase 1 (en route) host and oceanic computer system replacement (HOCSR).* Atlantic City International Airport, NJ: FAA William J. Hughes Technical Center, NAS Human Factors Branch (ACT-530).

Appendix A

Phase 2 Questionnaire

Changed NAS Monitor Input Messages

Please review the following changes to NAS Monitor input messages. Following each change description, you will be asked to rate the overall impact of the change on your job. In order to assess the overall impact, please keep in mind the following questions:

a. How significant is the change?
b. Is this message going to be used in a way that is contrary or opposite to the way it is currently used?
c. How easy or difficult will it be to adapt to the change?
d. How does the change affect your workload (i.e., amount of information that has to be entered) and memory load?

If you find that a change will have a high impact on your job, please explain how you arrived at that conclusion in the space provided. Please also let us know if you feel that a change is an improvement (i.e., decreases your workload or memory load).

1. Specify DASD
DASD

DASD address is now 3 characters, not 4.

Example: DASD 120 320 326

The optional CPU1 and CPU2 keywords of the STBY mode variation of the DASD message are no longer valid when IPLing Standby Native.

_____ Impact
☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

2. Set Non-Operational Units Redundant
SETA

The purpose of the message is to specify which non-operational elements are available to the operational system.

SETA now applies only to a valid element type of LDDA, PAMRI, DPCU, or HID. There are no functional changes to the way the SETA message works. If the target element is in an unavailable status, the SETA message changes the status of the element to Available.

NOTE: Channels, devices, and control units can no longer be specified in the SETA message. Availability of devices, channels, and control units is performed via the VARY message.

_____ Impact
☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

3. Set Non-Operational Units Inactive

SETI

The purpose of the Set Non-Operational Units Inactive (SETI) message is to specify which non-operational HCS elements are unavailable the operational system.

SETI is used to set a redundant element to Inactive status. SETI now applies only to a valid element type of LDDA, PAMRI, DPCU, or HID. There are no functional changes to the way the SETI message works. If the target element is in Redundant status, the SETI message changes the status of the element to Inactive.

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

4. Set Non-Operational Units Test

SETU

Only element names are valid (availability of devices, channels and control units are performed via the VARY message). The SETU message may be used to disable the STBY processor.
Example: SETU CPU2

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

5. Swap Peripherals

SWAP

A new syntax for the "SWAP" message is implemented because the current message makes us eof a "channel number"

SWAP <cu_id {{PATH} {CPU}} {NONE}} > *not* SWAP <cu_id> OPER | STBY channel

will cause the current path and /or CPU attachment of a given control unit to be "swapped" to the other position.

Example: SWAP KCU1 PATH CPU
SWAP PRN2 CPU

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

6. Scan Disk

SDSK

Entry of "SDSK dataset DIRECTORY" will display member list

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

7. Mandatory Replacement of an Operational Element

MREP

No longer allows the "with" option

Example: MREP PAM1 WITH PAM3 is now an invalid message

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

8. Replace an Operational Element

REPL

No longer allows the "with" option

Example: MREP PAM1 WITH PAM3 is now an invalid message

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

9. Request Logical Device Assignment

ASGN

Allow range to be specified using LDS/LDS in addition to LDN/LDN

Example: NPOI CIOT2 / SWIOT

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

10. Inquire Assignment of Logical Devices

ISGN

Allow range to be specified using LDS/ LDS in addition to LDN /LDN

Example: NPOI CIOT2 / SWIOT

_____ Impact
☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

11. Inquire Assignment of Physical Device

DSGN

Used to obtain information that associates by physical device each logical device assignment. DSGN now provides a three-character PDA in the output message instead of a four-character channel and unit address. It now allows the input of a physical device mnemonic (PDS) as well as a physical device address (PDA). There are no changes in function to the DSGN message.

There is no change to the format for the DSGN message.

The changed solicited responses to a correctly entered DSGN message are:

From: LDN lds/ldn ASSIGNED TO pds/(a)cuu s (pds/(a)cuu s) (pds/(a)cuu s) (pds/(a)cuu s) (INACCESSIBLE) (NOP'ED)

To: LDN lds/ldn ASSIGNED TO pds/pda s (pds/pda s) (pds/pda s) (pds/pda s) (INACCESSIBLE) (NOP'ED)

From: LDN lds/ldn ASSIGNED TO pds/(a)cuu-pn s pds/(a)cuu-pn s pds/(a)cuu-pn s (INACCESSIBLE) (NOP'ED)

To: LDN lds/ldn ASSIGNED TO pds/pda-pn s pds/pda-pn s pds/pda-pn s (INACCESSIBLE) (NOP'ED)

Where: lds/ldn is the logical device mnemonic or number
pds is the physical device mnemonic
pda is the physical device address
s is the device status
pn is the FSP printer number if applicable
and where status is a one-letter symbol.

_____ Impact
☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

12. No-Op Input /Output on Logical Device

NPIO

Allow range to be specified using LDS / LDS in addition to LDN/ LDN

Example: NPIO CIOT2 / SWIOT

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

13. OP Input /Output on a Logical Device

OPIO

Allow range to be specified using LDS / LDS in addition to LDN / LDN

Example: NPIO CIOT2 / SWIOT

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

14. Specify Debug Requirements

DBUG

Allow querying of a bit value. Output expanded text (adapted) for mask query or change. (NOTE: Not really part of ESA but it is in A5F1.0)

Example: DBUG 50

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

15. Printout Message Monitor

POMM

Used to produce a summarized report of the data collected in the IOMM data set (DVMDS) by the I/O Message Monitor. The output summary includes the total number of input and output messages and the number of solid errors encountered on both input and output operations.

POMM removed IOT, and added IFDS to the input field.

The format for the POMM message has not changed; only the field contents of the POMM message has changed.

cccccc is a required field used to specify one of the following:

(a) A 3 or 4 character mnemonic which specifies a device type, i.e., all the devices of the specified type. The device types are FDEP, FSP, CUE and IFDS or ALL, indicating all of the above device types.

(b) A 3-digit hexadecimal number specifying a physical device address (pda).

(c) A mnemonic of 2 to 6 alphanumeric characters that specify an adapted physical device mnemonic (pds).

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

16. Configure PAMs /HIDs Message

CNFG

Used to specify the PAMRI, DPCU, and HID configuration if different from the adapted configuration or to specify NONE if none are desired.

The CNFG message is primarily used during NAS pre-initialization as a sub-option to change the adapted PAM configuration (PAMRI, HID, DPCU). If entered after pre-initialization, the CNFG message reports the configuration being used.

CNFG is not eligible in STBY. NAS Standby on IPL now gets DASD, Configuration Data (CNFG) and CPUID information at startup from the Primary NAS via the channel-to-channel (CTC) interface.

The added rejection response for CNFG is as follows:

REJECT INVALID IN STANDBY MODE

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

17. Set Base Location with a Symbolic Address to Modify /Display Storage

MODS

MODS to a non-buffered entry point is allowed after ENDI

Impact

_____ ☐ Very High

_____ ☐ High

_____ ☐ Moderate

☐ Low

☐ Very Low

18. Branch and Link to Absolute Address

BALX

Allow "@symbol" to reference address symbolically, in addition to hex address

Example: BALX @NASMAP

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

19. Set BAL Location

SBAL

Allow "@symbol" to reference address symbolically, in addition to hex address

Example: BALX @NASMAP

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

20. Display Storage

DISP

Output 16 bytes of data, instead of 8 bytes

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

21. Display Storage Relative to SMOD or MODS

RDSP

Output 16 bytes of data, instead of 8 bytes

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

22. Output Configuration Related Data

OUTP

Allow OUTP CS during Startup and Startover. New OUTP dump designators

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

23. Select Recording code / On line Printout Option

RCOP

Allow use of PE names in addition to PE ID

Example: RCOP 214 3 CDA
SPEL MTD

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

24. Attach TOBQ-TOIQ Clock to a Queue

RELA

Allow use of PE names in addition to PE ID
Example: RCOP 214 3 CDA
SPEL MTD

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

25. Schedule Program Element

SPEL

Allow use of PE names in addition to PE ID

Example: RCOP 214 3 CDA
SPEL MTD

_____
_____
_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

26. Control Tape Logical Device

TAPE

Used to allow the user to initiate a specified control operation on a given tape unit.

The TAPE message allows the user to perform tape-related control actions such as rewinding, unloading, and writing a tape mark on a targeted tape.

TAPE now allows the control actions to be specified with a mnemonic as well as a number.

Example: TAPE CORE REW

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

27. Channel Utilization Monitoring

CHNU

Used to initiate and terminate the monitoring of channel utilization, and to generate the Channel Utilization Report on demand.

The Channel Utilization Report refers to Channel-Path Ids (CHPIDs) rather than channels.

The format for the CHNU message has not changed, but the Channel Utilization Report has changed.

CHNU (ON | OFF) (1..10) (K) (P)

A sample output for the CHNU message is as follows:

0005/99 CHANNEL PATH UTILIZATION REPORT 00:00:00 TO 00:05:00

CHP80	CHP81	CHP90	CHP91	CHP92	CHP94	CHP95	CHP96
0%	0%	0%	2%	1%	2%	0%	0%
CHPA0	CHPA1	CHPBC	CHPBD	CHPBE	CHPE8	CHPE9	CHPEA
0%	0%	0%	3%	1%	2%	3%	0%
CHPEC	CHPED						
0%	0%						

A/C ACTY P0034 A0221 T109 M000 PROCESSOR PREV MIN 2%

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
	☐ Low
	☐ Very Low

New NAS Monitor Messages

Please review the following descriptions of new NAS Monitor messages. Following each change description, you will be asked to rate the overall impact of the change on your job. In order to assess the overall impact, please keep in mind the following questions:

a. How significant is the change?

b. Does this message provide functionality that is different from that currently available?

c. How easy or difficult will it be to adapt to the change?

d. How does the change affect your workload (i.e., amount of information that has to be entered) and memory load?

If you find that a change will have a high impact on your job, please explain how you arrived at that conclusion in the space provided. Please also let us know if you feel that a change is an improvement (i.e., decreases your workload or memory load).

1. Inquire Path Assignment

PSGN

New message "PSGN" is added which display the enable /disable and path status of the specified device number

PSGN {pda | pds}
hhmm /dd PATH STATUS FOR DEVICE pda / pds – {ONLINE | OFFLINE}
CHPID dd – {AVAILABLE | UNAVAILABLE} (repeated for each path)
CHPID dd – {AVAILABLE | UNAVAILABLE}

_____

_____

_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

2. Resume Mode Startover

RESM

A new message is added to allow for a requested resume mode startover on the primary or on the support processor: Example: RESM {PRIM | STBY}

Where PRIM indicates that the resume mode is requested for the primary processor and STBY indicates that it is requested for the support processor. RESM with no fields implies the primary processor. RESM causes a full I/O reset.

_____

_____

_____

Impact
☐ Very High
☐ High
☐ Moderate
☐ Low
☐ Very Low

3. Vary Device/ Path

VARY

A New message is added to replace the ability to "SETA" a channel or device

VARY {ON | OFF}pda path

Which will allow the user to remove form or add to the configuration a specific device or a specific path to a device.

- If the user specifies a path (specified as CHP##) then the specified CHPID will be the target of the VARY operation
- If the user specifies only a device number, then the specified device will either be disabled or enabled at the subchannel
- If the user specifies a path and a device, only the specific path to the given device will be affected by the operation

Note that, because of this change, the SETA /SETI/ SETU messages will be restricted to elements (CPU, LDDA, PAM, HID, DPCU) and will no longer be eligible for devices or control units.

_____

_____

_____

Impact

- ☐ Very High
- ☐ High
- ☐ Moderate
- ☐ Low
- ☐ Very Low

Deleted NAS Monitor Input Messages

The following NAS Monitor input messages are being deleted. Please review these changes and rate the overall impact of the change on your job. In order to assess the overall impact, please keep in mind the following questions:

a. How significant is the change?

b. Is all of the functionality provided with this message now handled through another message? Through multiple messages?

c. How easy or difficult will it be to adapt to the change?

d. How does the change affect your workload (i.e., amount of information that has to be entered) and memory load?

If you find that a change will have a high impact on your job, please explain how you arrived at that conclusion in the space provided. Please also let us know if you feel that a change is an improvement (i.e., decreases your workload or memory load).

1. End Tape Initialization Inputs

ETAP

ETAP was used to terminate input from the tape paired with the Initialization Tape logical device number (LDN) during initialization at startup and startover. This message is replaced by the Read Fixed Record (READ) message. If ETAP is entered, INVALID MESSAGE TYPE is displayed.

_____ Impact
_____ ☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

2. Read Initialization Inputs from Tape

ITAP

ITAP was used to enter inputs from the tape paired with the initialization tape logical device number (LDN) during initialization at startup and startover. This message is replaced by the Read Fixed Record (READ) message. If ITAP is entered, INVALID MESSAGE TYPE is displayed.

_____ Impact
_____ ☐ Very High
_____ ☐ High
_____ ☐ Moderate
☐ Low
☐ Very Low

3. Set Tape Density

TDEN

TDEN was used to change the default value established for the tape density for the two model types of the 3420 series tape devices.

TDEN is not replaced by another message, as the 3420 tapes devices have been deleted.

If TDEN is entered, INVALID MESSAGE TYPE is displayed.

	Impact
_____	☐ Very High
_____	☐ High
_____	☐ Moderate
_____	☐ Low
	☐ Very Low

Appendix B

Background Questionnaire

1. What is your current job title? _____

2. What location/facility are you currently assigned to? _____

3. What equipment/systems do you work with/maintain? _____

_____

4. How much experience do you have in your current job title?

   Years: _____ Months: _____

5. How much experience do you have working at an ARTCC?

   Years: _____ Months: _____

6. What do you feel is your computer experience level?

   beginner ____ intermediate ____ advanced ____ expert ____

7. Have you received training on Phase 2 of the HOCSR program?

   Yes _____ No _____

   What type of training did you receive? Please check each that applies.

   Classroom _____ Hands-on _____

   Other (please specify): _____

8. Is there anything else we should know regarding your participation in this assessment?

   _____

   _____

   _____

   _____